

GaNEsHA: Opportunities for Sustainable Transportation in Smart Cities

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Abstract. In developed nations, cities experience a growing pressure to establish sustainable transportation solutions. However, currently cities have still only little knowledge about the transportation routines, needs and troubles of its citizens. A greater awareness of daily transportation activities could support cities to build up customized transportation infrastructures that meet sustainable requirements. To address this gap, we build the GaNEsHA mobile application. A mobile crowd-sensing tool to track mobility activities. We used the tool as a probe in an interview study with 14 citizens. Our findings indicated a need for ICT design to move beyond normative tools that simply aim to 'encourage' people to adopt sustainable practices. Instead, we identified different transitions how municipal mobility services can support sustainable mobility practices. These include: (1) creating awareness of environmental footprints, (2) supporting alternative transportation options, (3) optimizing towards individual needs, (4) facilitating local communities and participative approaches.

Keywords: Sustainable mobility, mobile crowd-sensing; smart city, behavior change.

1 Background

Private transportation currently accounts for about a quarter of global CO₂ emissions. Given current trends, this value is set to increase by roughly 50% between now and the year 2030. In particular, many German cities are suffering from too high nitrogen values [1]. Throughout the western world, a (neo-) liberal agenda has arguably placed a greater burden upon individuals as 'citizen-consumers' to both consume for the sake of the market whilst accepting responsibility for the sustainability of their actions [4]. Over the last decade the sustainable HCI community has seen papers presenting interactive technologies that variously aim to support, inspire or persuade people to adopt pro-environmental behaviors [5]. A core assumption here is that the right kind of information about one's behavior and its environmental effects will encourage more environmentally-friendly and sustainable habits [2]. However, measures aimed at changing individual behavior often face very low levels of uptake, complex constraints and even resistance [6]. Critique of these approaches often points to the normative

stance of assuming sustainable mobility is the only ‘good’ mobility, which risks being unintentionally paternalistic and behavioristic [3].

Addressing this issue, we are not questioning how to better persuade citizen-consumers to conduct a more sustainable mobility, but instead to focus on the question how cities and its local municipal mobility services can provide appropriate transportation infrastructure that support multimodal sustainable mobility choices. Nowadays cities have only very little knowledge how its citizen experience sustainable mobility in their daily activities and how it can be optimally supported. Therefore, we question in this paper the notion of simply 'encouraging' people to adopt more sustainable mobility practices not from the normative perspective of individual citizens, but from the perspective of local municipal mobility services in cities.

2 Method and Prototype

To explore on the research question, we conducted interviews with 14 ‘ordinary’ citizens. Within these interviews we aimed to explore daily mobility practices while addressing interviewees “as analysts of their own and others’ practices”. To tackle this issue, we used a prototype to track mobility activities, then used the collected data as a probe to trigger detailed descriptions. The prototype provided an outline of users’ various journeys and associated modes of transport. We recorded the movements of all interviewees over a period of four weeks prior to the actual interviews taking place. This allowed us to review the rationales for various journeys in relation to concrete situations during the interviews. Additionally, the prototype offered some simple visualizations to sensitize interviewees to the possible environmental impact of their private mobility (see Figure 1). Overall, we found that the records helped interviewees to remember specific events, which served as prompts for stimulating reflections or to trigger richer accounts of particular journeys undertaken. Focusing on concrete situations also helped people to articulate specific rationales for the use of a particular mode of transport and the circumstances that led to it.

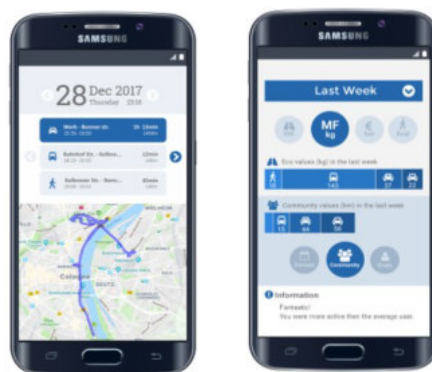


Figure 1. The picture on the left shows collected travel information. The picture on the right shows sustainability measurements. These designs were subsequently slightly modified to improve readability.

3 Results and Outlook

The analysis showed clearly that, although all participants spoke at some point during their interviews about the positive value of sustainability, sustainable mobility was not addressed as a driving factor in and for the organization of daily journeys. Moreover, we found that mobility practices were expressed to come with different practical exigencies that oriented to sustainable mobility in divergent ways. They incorporate: knowledge and information, self-reflection, thrift, comfort and collective responsibility. The prototype has helped to focus on these practical exigencies, how the interviewees actually handled sustainable mobility. We believe that the identification of practical exigencies is useful in order to use ICT to support sustainable mobility solutions beyond gross normative appeals (e.g. 'be sustainable!'). The points we have identified can be collected under more general themes that may inspire city services concerned with sustainable mobility. First of all, there is a need to design with a focus beyond a normative appeal of sustainable behavior, but to (1) creating awareness of environmental footprints. Secondly, we see opportunities by examining other values that are important for sustainable practices in (2) supporting alternative transportation options. Thirdly, this study offers a positive example to inspire the design regarding mobility practices and (3) optimizing towards infrastructural needs of the citizens. Lastly, we see a lot of potential in addressing different stakeholder groups who collaborate around processes of mutual learning and innovation (4) facilitating local communities & participative approaches. It would be interesting to study in future works more detailed how the prototype can be enhanced to take a deeper look at the daily mobility activities of the citizens. Cities could learn more about the concrete mobility needs and transport resources and how both can be better matched to support sustainable mobility.

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